Broadband Radio Research and Propagation Measurements

Outputs

- Study of MIMO antenna systems and information theory relating to MIMO systems.
- Study of relative propagation impairments between 2.4 GHz ISM band and 5.8 GHz communications band.

An ongoing program of radiowave propagation research and measurements is supported using the ITS Mobile Radio Propagation Measurement Facility and the Digital Channel Probe. By using these facilities, researchers have the ability to determine propagation conditions and impairments which affect new digital communication systems and answer questions regarding the viability of proposed radio services.

The system has been configured to study the relative propagation impairments between the 2.4-GHz ISM band and the recently allocated 5.8-GHz communications band. Mobile data was collected in an urban environment and the relative impairments were quantified. This data is intended to help system designers of next generation systems in the 5.8-GHz band determine the relative power requirements and link budgets needed versus systems in personal communications services (PCS) and cellular bands. It will also help promote commercial high frequency spectrum use and frequency extension.

More recently the system was configured to quantify the propagation conditions in a reverberation chamber (Figures 1 and 2). These data were collected to determine the suitability of the chamber for comparative performance testing of multiple-input multiple-output (MIMO) communication systems.

Figure 1. Test equipment configured for 4 channel operation at 2.4 GHz for NIST reverberation chamber characterization (photograph by F.H. Sanders).

Figure 2. MIMO test setup in NIST reverberation chamber. Antennas configured for single input single output measurement (photograph by F.H. Sanders).

Recent Publications

J.J. Lemmon, "Radiation pattern analysis of a four-element linear array," NTIA Technical Memorandum TM-05-426, Aug. 2005.

J.J. Lemmon, "MIMO channel capacity with discrete alphabets," in *Proc. Wireless 2005*, Calgary, Jul. 2005.

P. Papazian, "Basic transmission loss and delay spread measurements for frequencies between 430 MHz and 5750 MHz," *IEEE Transactions on Antennas and Propagation*, Feb. 2005.

For more information, contact:
Peter B. Papazian
(303) 497-5369
e-mail ppapazian@its.bldrdoc.gov